in northern South America and Panama. It contains in the neighborhood of a dozen species, and is at once separated from *Paphiopedilum* by the character of the lip in which the margin of the opening is marked by a broad infolded portion. In addition to this the ovary is 3-celled and the sepals valvate in the bud; the scape, moreover, bears several, sometimes many, flowers.

We have then in the New World three of the genera, two, *Phragmipedium* and *Selenipedium* not known elsewhere, and *Cypripedium* which it shares in distribution with the Old World. The only strictly Old World genus is *Paphiopedilum*.

The meeting adjourned at 4:30 P. M.

PERCY WILSON,
Secretary

OF INTEREST TO TEACHERS

COLLEGE ENTRANCE BOTANY (CONCLUDED)

SPECIFICATIONS OF THE TOPICS TO BE STUDIED

Part I. The General Principles of (A) Anatomy and Morphology, (B) Physiology and Ecology

A. ANATOMY AND MORPHOLOGY.

The Seed. Four types (dicotyledon without and with endosperm, a monocotyledon and a gymnosperm); structure and homologous parts. Food supply; experimental determination of its nature and value. Phenomena of germination and growth of embryo into a seedling (including bursting from the seed, assumption of position and unfolding of parts).

The Shoot. Gross anatomy of a typical shoot; including the relationships of position of leaf, stem (and root), the arrangement of leaves and buds on the stem, and deviations (through light adjustment, etc.) from symmetry. Buds, and the mode of origin of new leaf and stem; winter buds in particular. Specialized and metamorphosed shoots (stems and leaves). General structure and distribution of the leading tissues of the shoot; annual growth; shedding of bark and leaves.

The Root. Gross anatomy of a typical root; position and origin of secondary roots; hair-zone, cap and growing-point.

Specialized and metamorphosed roots. General structure and distribution of the leading tissues of the root.

The Flower. Structure of a typical flower, especially of ovule and pollen; functions of the parts. Comparative morphological study of four or more different marked types, with the construction of transverse and longitudinal diagrams.

The Fruit. Structure of a typical fruit. Comparative morphological study of four or more marked types with diagrams.

This comparative morphological study of flowers and fruits may advantageously be postponed to the end of II, and then taken up in connection with the classification of the Angiosperms.

The Cell. Cytoplasm, nucleus, sap-cavity, wall.

As to the study of the cell, it is by no means to be postponed for consideration by itself after the other topics, as its position in the above outline may seem to imply, but it is to be brought in earlier, along with the study of the shoot or root, and continued from topic to topic. Although enough study of the individual cell is to be made to give an idea of its structure (a study which may very advantageously be associated with the physiological topics mentioned first under B), the principal microscopical work should consist in the recognition and study of the distribution of the leading tissues.

B. Physiology and Ecology.

Rôle of water in the plant; *absorption* (*osmosis*), *path of transfer, transpiration, turgidity and its mechanical value, plasmolysis.*

Photosynthesis; *Dependence of starch formation upon chlorophyl, light, and carbon dioxide; evolution of oxygen,* observation of starch grains.

Respiration; *need of oxygen in growth, evolution of carbon dioxide.*

Digestion; *Digestion of starch with diastase,* and its rôle in translocation of foods.

Irritability; *Geotropism, heliotropism* and *hydrotropism.*

Growth; *localization in higher plants; amount in elongating stems; relationships to temperature.*

Fertilization; sexual and vegetative reproduction.

Although for convenience of reference, the physiological topics are here grouped together, they should by no means be studied by themselves and apart from anatomy and morphology. On the contrary, they should be taken up along with the study of the structures in which the processes occur, and which they help to explain; thus — photosynthesis should be studied with the leaf, as should also transpiration, while digestion may best come with germination, osmotic absorption with the root, and so on. The student should either try, or at least aid in trying, experiments to demonstrate the fundamental processes indicated above in italics.

Modifications (metamorphoses) of parts for special functions.

Dissemination. Cross-pollination.

Light relations of green tissues; leaf mosaics.

Special habitats; Mesophytes, Hydrophytes, Halophytes, Xerophytes; Climbers, Epiphytes, Parasites (and Saphrophytes), Insectivora.

The topics in ecology (particularly the first four and in part the fifth), like those in physiology, are to be studied not by themselves, but along with the structures with which they are most closely associated, as cross-pollination with the flower, dissemination with the seed, etc. The fifth may most advantageously be studied in G in Part II.

In this connection field-work is of great importance, and, for some topics, is indispensable, though much may be done also with potted plants in green-houses, photographs, and museum specimens. It is strongly recommended that some systematic field-work be considered as an integral part of the course, coördinate in definiteness and value as far as it goes with the laboratory work. The temptations to haziness and guessing in ecology must be combated.

Part II. The Natural History of the Plant Groups, and Classification

A comprehensive summary of the great natural groups of plants, based upon the thorough study of the structure, reproduction and adaptations to habitat of one or two types from each

group, supplemented and extended by more rapid study of other forms in those groups. Where living material is wanting for the latter, preserved material and even good pictures may be used, and a standard text-book should be thoroughly read. The general homologies from group to group should be understood, though it is not expected that these will be known in detail.

In general, in this part of the course, it is recommended that much less attention be given to the lower and inconspicuous groups, and progressively to the higher and conspicuous forms.

Following is a list of recommended types from which, or their equivalents, selection may be made:

A. ALGAE. *Pleurococcus. Sphaerella, Spirogyra, Vaucheria, Fucus, Nemalion* (or *Polysiphonia* or *Coleochaete*).

B. FUNGI. Bacteria, *Rhizopus*, or *Mucor*, Yeast, *Puccinia* (or a powdery mildew), Corn Smut, Mushroom.

Bacteria and yeast have obvious disadvantages in such a course, but their great economic prominence may justify their introduction.

C. LICHENS. *Physcia* (or *Parmelia*, or *Usnea.*

D. BRYOPHYTES. In Hepaticae, *Radula* (or *Porella* or *Marchantia*). In Musci, *Mnium* (or *Polytrichum* or *Funaria*).

E. PTERIDOPHYTES. In Filicineae, *Aspidium* or equivalent, including, of course, the prothallus.

In Equisetineae, *Equisetum.*

In Lycopodineae, *Lycopodium* and *Selaginella* (or *Isoetes*).

F. GYMMOSPERMS. *Pinus* or equivalent.

G. ANGIOSPERMS. A monocotyledon and a dictoyledon, to be studied with reference to the homologies of their parts with those in the above groups; together with representative plants of the leading subdivisions and principal families of Angiosperms.

Classification should include a study of the primary subdivisions of the above groups, based on the comparison of the types with other living (preferably) or preserved material. The principal subdivisions of the Angiosperms, grouped on the Engler and Prantl system, should be understood.

The ability to use manuals for the determination of the species of flowering plants is not considered essential in this course,

though it is most desirable. It should not be introduced to the exclusion of any part of the course, but should be made voluntary work for those showing a taste for it. It should not be limited to learning names of plants, but should be made a study in the plan of classification as well.

The preparation of an herbarium is not required nor recommended except as voluntary work for those with a taste for collecting. If made, it should not represent so much a simple accumulation of species as some distinct idea of plant associations, or of morphology, or of representation of the groups, etc.

The recent report of Gifford Pinchot, chief forester of the United States, shows that about 700,000 trees were planted last year on forests in Nebraska, Kansas, Colorado, New Mexico, Arizona, Utah, Idaho, and California. There are now growing at the planting stations more than 2,200,000 trees, which will be ready for planting in 1909. Sufficient seed was sown in the spring of 1908 to produce 4,600,000 seedlings.

For the *Bulletin of the New York Botanical Garden* issued February, 1909, Addison Brown has written an interesting account of the Elgin Botanical Garden, created by Dr. David Hosack, and its relation to Columbia College. The *Bulletin* also contains a paper on the North American Gill Fungi with a simple key that will be very helpful to many readers of TORREYA. Each of the above contributions is also issued separately by the New York Botanical Garden.

At the first annual conference of the governors of New England one session was devoted to the planting of trees. Forest trees were discussed, but especial interest was shown in orchard trees. New England, with its convenient markets, low land prices, and large proportion of hilly country not well suited to farming, could easily rank first in the production of apples, if the business were conducted with the energy characterizing western agricultural enterprises and guided by up-to-date methods.

Mycologia, the new journal issued from the New York Botanical Garden, contains the following on the chestnut canker which Dr. Murrill has earlier described for TORREYA: It is well known that practically all of the chestnut trees in and about New York City have been killed within the past few years by the chestnut canker, *Diaporthe parasitica;* but the number of trees destroyed has been only very roughly estimated. Through the efforts, however, of Mr. J. J. Levison, arboriculturist of the parks of Brooklyn, who has made a careful survey of Forest Park, it is now known that 16,695 chestnut trees were killed in the 350 acres of woodland in this park alone. Of this number, about 9,000 were between eight and twelve inches in diameter, and the remaining 7,000 or more were of larger size.

A report has been made by the Commission which was appointed by the Association of American Agricultural Colleges and Experiment Stations in 1906, to consider various matters relating to the expenditure of public funds. The members of the commission are David Starr Jordan, Stanford University, chairman; Whitman Howard Jordan, of Geneva, New York, secretary; Henry Prentiss Armsby, State College, Pennsylvania; Gifford Pinchot, Washington, D. C., and Carroll Davidson Wright, Clark College, Massachusetts. Among other recommendations are the following:

1. Every effort should be made to promote the training of competent investigators in agriculture both in the agricultural, and, so far as practicable, in the non-agricultural, colleges and universities, and their training should be as broad and severe as for any other field of research.

2. The progress of agricultural knowledge now demands that agricultural research agencies shall deal as largely as possible with fundamental problems, confining attention to such as can be adequately studied with the means available.

3. The work of research in agriculture should be differentiated as fully as practicable, both in the form of organization and in the relations of the individual investigator, from executive work, routine teaching, promotion and propaganda, and should be under the immediate direction of an executive trained in the methods of science who should not be hampered by other duties of an entirely unlike character.

4. An advisory board is suggested consisting of members appointed by the Secretary of Agriculture and by the Association of American Agricultural Colleges and Experiment Stations, respectively, which shall confer with the Secretary of Agriculture regarding the mutual interests of the department and the stations and shall consider the promotion of agricultural investigation in general.